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EXAMINER

AHMED, SHAMIM

ART UNIT PAPER NUMBER

1765

DATE MAILED: 02/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/061,836

Applicant(s)

MILLER ET AL.

Examiner

Shamim Ahmed

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 December 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 4, 10-19 and 21-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 4, 10-19 and 21-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12/08/03.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicant's arguments with respect to claims 21-26 have been considered but are moot in view of the new ground(s) of rejection.

Applicants argue that Fujikawa does not teach that the slot has an aspect ratio of greater than or equal to about 3.

In response, examiner states that the argument is not persuasive because aspect ratio of the slot is not limited to only one portion of the slot and Fujikawa teach that the slot includes narrowest width is 140 micro meter and the thickness of the semiconductor substrate is 625 micro meter (see figure 3).

Therefore, the aspect ratio is greater than 3.

### ***Information Disclosure Statement***

2. It is reminded that the Japanese reference (11-198387) of the information disclosure statement (IDS) submitted on 12/08/03 is already cited by examiner in the previous office action (see PTO-892). Therefore, the reference is already been considered.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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4. Claims 10-15 and 17-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Fujikawa (JP-11-198387).

As to claim 10, since the process steps are not in sequence, Fujikawa disclose a process of forming a slot in a print head substrate, wherein forming a trench (10) in a first surface of the substrate (1) opposite to a side subjected to an isotropic etching by sand blasting or dry etching or the like and a step of forming a second trench or opening by subjecting the substrate (lower surface) to anisotropic etching while penetrating the trench (10) in order to form the slot (see the abstract and figures 2a-2b and paragraph 0014 of the translated version).

Fujikawa also teach that the anisotropic etching could comprise a chemical dry etching (see paragraph 0041 of the translated version).

Fujikawa teaches the width of the slot is 140 micrometers and the thickness of the substrate is 625 micrometer (see paragraph 0037-0038), which teaches the limitation of the slot having an aspect ratio of greater than or equal to about 3 because aspect ratio is the thickness of the substrate divided by the width of the slot.

As to claim 11, Fujikawa teaches that the step of removing is an anisotropic etching, which comprises chemical dry etching (see paragraph 0041).

As to claim 12 , Fujikawa teaches that the trench 10 can be formed by dry etching before the anisotropic act of removing (claim 12) or act of creating in order to form the opening or slot through the entire substrate (claim 26) (see the abstract)

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As to claim 13, Fujikawa teaches that the dry etching is actually performed several times and the amount of over etching is calculated, which is not larger than the previous etching (see paragraph 0037 of the translated version).

As to claims 14-15, Fujikawa teaches that the width of the second trench is less than 240 micrometers (microns), wherein the second trench is considered to be the trench 10, which is less than 50 percent of the substrate thickness, since the process steps are not in sequence in the instant application (see figures 2a-2b).

As to claim 17, since the process steps are not in sequence, Fujikawa teaches forming a second trench having a length that the breakthrough occurs at about 25-about 75 percent length of the first trench, wherein the second trench is considered to be the trench 10 (see figures 2a-2b).

As to claim 18, since the process steps are not in sequence, Fujikawa teaches that the first trench (anisotropic) has a depth of about 25-about 75 percent of the substrate thickness (see figure 2b).

As to claim 19, Fujikawa teaches the maximum width of the second trench (10) is 140 micrometers, which is less than 300 percent of the first trench formed by anisotropic etching (paragraph 0036 of the translated version and figure 2b).

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sherman et al (6,312,612).

Sherman et al disclose a process of forming slot (460) in a semiconductor substrate, wherein the substrate (410) is etched to form a first opening or trench (see figure 19) and then the substrate is dry-etched from the opposite side of the first opening to form the through-hole (col.14, lines 53-col.16, lines 31 and figure 21). Sherman et al remain silent about the maximum width of the through-hole or slot is less or equal to about 50% of the thickness of the substrate.

However, Sherman et al teach that the substrate thickness can be larger in height in order to make a very large internal volume for holding fluid (col.16, lines 32-45 and lines 52-62).

Therefore, it would have been obvious to one ordinary skilled in the art at the time of claimed invention to have the maximum width of the hole/slot is less than 50% of

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the substrate thickness because the substrate can be larger in height in order to make bigger fluid handling device as taught by Sherman et al.

8. Claims 21-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujikawa (JP-11-198387) in view of Yasukawa et al (6,139,132).

Fujikawa discussed above in the paragraph 4 but fail to teach that the maximum width of the slot is less than or equal to 50% of the thickness of the substrate.

However, in a method of making through-hole or slot, Yasukawa et al teach that the maximum width of a slot (41) to be made as small as possible and the through-hole is formed for smoothly passing a fluid like ink and thereby, air bubbles is prevented (see col.8, lines 1-28).

Therefore, it would have been obvious to one ordinary skilled in the art at the time of claimed invention to combine Yasukawa et al's teaching into Fujikawa's process for reasonable expectation of success by reducing the maximum width of the slot for preventing stagnation of air bubbles from the ink/fluid during the ink flow as taught by Yasukawa et al.

As to claim 26, Fujikawa fails to teach that dry etching is performed before the act of sand drilling or sand blasting.

However, it would have been obvious to one skilled in the art at the time of claimed invention to rearrange the process sequence, since it has been held that the transposition of process steps or the splitting of one step into two, where the processes are substantially identical or equivalent in terms of function, manner and result, was

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held to be not patentably distinguish the processes. *Ex parte Rubin* 128 USPQ 440 (PTO BdPatApp 1959).

9. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujikawa (JP-11-198387) in view of Yagi et al (6,143,190).

Fujikawa discussed above in the paragraph 4 but fail to teach that the maximum width of the slot is less than or equal to 50% of the thickness of the substrate.

However, in a method of making through-hole or slot, Yagi et al teach that the maximum width of hole (225) is 145  $\mu$ m and the thickness of the silicon substrate is 625  $\mu$ m and the width is less than 50% of the substrate (col.24, lines 8-19).

Therefore, it would have been obvious to one ordinary skilled in the art at the time of claimed invention to combine Yagi et al's teaching into Fujikawa's process to optimize the width of the hole, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch* F.2d 272, 205 USPQ (CCPA 1980).

### ***Double Patenting***

10. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).



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Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

11. Claims 4, 10-19 and 21-23 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 16-17, 22-23, 28 and 34-37 of copending Application serial No. 10/061,828.

Claims 4, 10-19 and 21-23 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 16-17, 22-23, 28 and 34-37 of copending Application No. 10/061,828. Although the conflicting claims are not identical, they are not patentably distinct from each other because the instant application differs from the co-pending application (10/061,828) is that the first trench is created with a laser machining.

However, it would have been obvious the dry etching includes the laser etching or drilling because laser machining is a kind of dry etching.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

12. Claims 4, 10-19 and 21-23 are rejected under 35 U.S.C. 102 (e)/103(a) as being anticipated or alternatively obvious over Rivas et al (Application serial No. 10/061,828, Publication No. US 2003/0140497 A1).

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome

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by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). For applications filed on or after November 29, 1999, this rejection might also be overcome by showing that the subject matter of the reference and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person. See MPEP § 706.02(I)(1) and § 706.02(I)(2). The instant application differs from the co-pending application (10/061,828) is that the first trench is created with a laser machining.

However, it would have been obvious to one ordinary skilled in the art to create a trench using laser machining or laser etching or drilling because dry etching includes laser machining.

13. Claims 4, 10-19 and 21-23 are directed to an invention not patentably distinct from claims 16-17, 22-23, 28 and 34-37 of commonly assigned co-pending application serial NO. 10/061,828. Specifically, dry etching includes laser machining.

The U.S. Patent and Trademark Office normally will not institute an interference between applications or a patent and an application of common ownership (see MPEP § 2302). Commonly assigned co-pending application serial NO. 10/061,828, discussed above, would form the basis for a rejection of the noted claims under 35 U.S.C. 103(a) if the commonly assigned case qualifies as prior art under 35 U.S.C. 102(f) or (g) and the conflicting inventions were not commonly owned at the time the invention in this application was made. In order for the examiner to resolve this issue, the assignee is required under 35 U.S.C. 103(c) and 37 CFR 1.78(c) to either show that the conflicting inventions were commonly owned at the time the invention in this application was made or to name the prior inventor of the conflicting subject matter. Failure to comply with this requirement will result in a holding of abandonment of the application.

A showing that the inventions were commonly owned at the time the invention in this application was made will preclude a rejection under 35 U.S.C. 103(a) based upon the commonly assigned case as a reference under 35 U.S.C. 102(f) or (g), or 35 U.S.C. 102(e) for applications filed on or after November 29, 1999.

#### ***Allowable Subject Matter***

14. The indicated allowability of claim 4 is withdrawn in view of the newly discovered reference(s) to US publication No. US 2003/0140497), Miyata et al (6,113,225) and Krut et al (US patent 5,391,236). Rejections based on the newly cited reference(s) follow and the rejection based on the US publication is mentioned above.

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15. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujikawa (JP-11-198387) in view of Krut et al (5,391,236).

Fujikawa discussed above in the paragraph 4 but fail to teach that the dry etching removes about 50% of the thickness of the substrate.

However, without showing any criticality of the limitation of removing of about 50% of the substrate, Krut et al teach a method of forming trench or slot or opening in a semiconductor substrate such as silicon, wherein the depth of the trench or opening is typically, roughly half of the substrate thickness (col.3, lines 34-46).

Therefore, it would have been obvious to one ordinary skilled in the art at the time of claimed invention to combine Krut et al's teaching into Fujikawa's process for easily forming the trench or opening without damaging the substrate because first half-etching of a substrate will create less pressure to the substrate than that of one time through etching of a substrate as taught by Krut et al.

16. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fujikawa (JP-11-198387) in view of Miyata et al (6,113,225).

Fujikawa discussed above in the paragraph 4 but fail to teach that the dry etching removes about 50% of the thickness of the substrate.

However, in a method of making through-hole or slot, Miyata et al teach a process for forming an opening or trench having a depth that is about 50% or half of the substrate thickness by conducting half-etching the silicon substrate in order to form opening with high accuracy (col.11, lines 60-col.12, lines 14).

Therefore, it would have been obvious to one ordinary skilled in the art at the time of claimed invention to combine Miyata et al's teaching into Fujikawa's process for forming an opening having a depth of about half of the substrate thickness for forming an opening with high accuracy in order to increase the speed of jetting of ink as taught by Miyata et al.

### ***Conclusion***

17. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Karasawa et al (6,467,876) disclose a process of dry etching a print head semiconductor substrate, where dry etching the substrate about 50% of the substrate thickness before an isotropic etching the substrate to form a slot (see figures 12-13).

Silverbrook (6,267,904) disclose a process of making slot or through hole in a semiconductor substrate using both-side etching (see figures 21-22).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shamim Ahmed whose telephone number is (571) 272-1457. The examiner can normally be reached on M-Thu (7:00-5:30) Every Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Shamim Ahmed  
Examiner  
Art Unit 1765

SA  
February 22, 2004